

Application No.: 10/759497

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REMARKS

Favorable consideration of the application in view the amended claims and the following remarks is respectfully requested. Claims 1 to 18 are pending. Claims 1, 3, 6, 7, 15 and 18 are amended.

Objections to the Specification

The disclosure was objected to because of the specific informalities noted by the Examiner in the Office Action. Applicants have addressed all of the informalities noted by the Examiner. Reconsideration of the amended disclosure and withdrawal of the objection is requested.

Objections to the Claims

Claims 1, 3, 6-7, 15 and 18 were objected to because of the informalities noted by the Examiner in the Office Action. Applicants submit amended claims 1, 3, 6, 7, 15 and 18 for reconsideration. The recitations of "TR-10 of -20°C or less" in claims 1 and 15 have been addressed. Additionally, applicants have removed the term "including" from the claims and replaced it with either "comprises" or "having." It is applicants' preference not to include "comprising" more than once in a claim. Thus the term "having" has been inserted. The changes suggested by the Examiner in claim 7 have been made. Applicants disagree with the Examiner that the term "substantially no perfluorinated vinyl ether" in claim 1 should be removed. Applicants aver that the meaning of such terms is interpreted through the specification. As such, the definition on page 2, lines 27-29 is sufficient for the purposes of defining the term. Regarding cure site moiety in claim 15, applicants aver that the recitation of the cure site moiety in either manner would be understood by one of skill in the art to mean that the polymer composition contains a site that enables cross-linking. Thus applicants aver that an amendment is not warranted.

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Rejections under 35 U.S.C. § 102

Claims 1-10 and 14-18 were rejected under 35 USC § 102(b) as being anticipated by Paglia et al. (U.S. Patent No. 6,506,460).

Regarding the limitation of the two parent composition Claims 1 and 15 as well as the parent process Claim 18, according to the Examiner Paglia et al. disclose that some UV radiation-curable fluoroelastomer compositions are useful for a low temperature cure process, wherein the fluoroelastomers are based on repeating units of vinylidene fluoride, hexafluoropropylene, at least one halogenated cure site monomer(s) and optionally tetrafluoroethylene (abstract, line 1-7; column 9, line 43-column 10, line 61). The Examiner stated that Paglia et al. further disclose that the polymers in the form of blend have been subjected to routine vulcanization with addition of multifunctional crosslinking agent and conventional mineral fillers in order to make articles (column 13, line 26-50; column 4, line 27-67). The Examiner indicated that Paglia et al. does not use perfluorinated alkyl vinyl ether (PAVE) in above-mentioned particular fluorinated copolymers (see column 9, line 43-49). Additionally, the Examiner averred that disclosure on low temperature cure would meet the limitation of "TR-10 of -20°C or less" (column 2, line 13-65).

The Office Action further refers to some of the dependent claims as follows.

Regarding Claims 7-9, Paglia et al. discloses that iodine- and bromine-containing monomers are all included and in some cases the bromine atom may be connected directly to the double bond (column 9, line 51-column 10, line 61; particularly see column 9, line 66 for Claim 9).

Regarding Claim 14, since a cure site monomer or a diiodine compound is incorporated in the copolymer for crosslinking purpose, the final cured product would carry the claimed or similar mechanical properties due to the presence of reactive sites in the copolymers.

Remaining dependent Claims 2-6, 10 and 16-17 were thereby rejected with the same reason as the above rejections of Claims 1, 7-9, 14-15 and 18.

Applicants' Response to the Rejections under 35 U.S.C. § 102

Applicants aver that the present invention is patentable over Paglia et al. Independent claims 1, 15 and 18 have been amended to indicate that the compound includes a peroxide curable component. Support for the amendment is found on page 4, line 27 through page 5, line 16. Thus no new matter is added to the specification with the amendments to claims 1, 15 and 18.

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The present invention is directed to a compound suitable for forming fluoroelastomers having the unique features of a low temperature property and desirable physical properties. The compound includes an elastomeric copolymer having interpolymerized units derived from vinylidene fluoride (VDF), at least one cure site moiety, and substantially no perfluorinated vinyl ether monomers. The compound also includes a peroxide curable component and at least one mineral filler. Upon vulcanization the resulting compound has desirable physical characteristics as indicated by the tensile strength, the elongation, and the temperature to 10% retraction at lower temperature (TR 10).

Paglia et al. disclose a UV curable elastomer composition. The Examiner has acknowledged this fact in the Office Action. Since the amended claims 1, 15 and 18 require a peroxide curable component, such claims would not be anticipated by Paglia et al. Claims 2-14 and 16-17 all depend, either directly or indirectly, from either claim 1 or claim 15. Thus, each of these claims is patentable at least on the basis of this dependency from a patentable base claim. Reconsideration of the amended claims and withdrawal of the rejection is respectfully requested.

Claim Rejections under 35 U.S.C. § 103

1. Brinati et al. in view of Araki et al.

Claims 1-18 were rejected under 35 USC § 103(a) as being unpatentable over Brinati et al. (U.S. Patent No. 5,175,223) or its equivalent EP 445,839 A1) in view of Araki et al. (U.S. Patent No. 6,706,819 B1).

Regarding the limitation of two parent composition Claims 1 and 15 as well as the parent process Claim 18, the Examiner noted that Brinati et al. in US and EP patents each discloses the preparation of fluoroelastomers having a low Tg and a low compression set at low temperatures (see column 1, line 42-column 2, line 18), the fluoroelastomers are based on repeating units of vinylidene fluoride (60.5-64 wt%), hexafluoropropene (30-33 wt%) and tetrafluoroethylene (5-8 wt%) (abstract, line 1-8; also see working examples on column 2, line 60-column 6, line 44). According to the Examiner, Brinati et al. further disclose that the polymers in the form of blend have been subjected to routine vulcanization with addition of accelerator and conventional fillers in order to make articles (column 3, line 36-59). It was noted by the Examiner that Brinati et al.

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does not mention or suggest the use of perfluorinated alkyl vinyl ether (PAVE) as co-monomer at all.

The Examiner acknowledged that the Brinati et al. reference is silent about adding "a cure site moiety" in the course of copolymerization. The Examiner stated that Araki et al. teach that a diiodine compound such as 1,3-diiodoperfluoropropane or if necessary a cure-site monomer can be incorporated in the copolymerization of fluorinated copolymers (column 7, line 5-26; column 5, line 59-column 6, line 52; see working example on column 22, lines 35-64). The Examiner indicated that by doing so, such reactive sites in the copolymers can improve crosslinkability in order to obtain better mechanical properties when cured (column 10, line 43-60).

The Examiner averred that in light of the fact that copolymer produced by all the involved references are containing the same or similar type of fluorinated monomers, which can be obtained through emulsion polymerization and the like. Therefore, the Examiner concluded that one having ordinary skill in the art would have found it obvious to modify Brinati's copolymerization process by adding the cure-site monomer(s) as taught by Araki et al. One would expect one advantage is that obtaining a final product with better mechanical properties when cured due to the presence of reactive sites in the copolymers.

The Office Action further refers to some of the dependent claims as follows.

Regarding Claims 7-9, Araki teaches that iodine-, chlorine-, nitrile- and bromine-containing monomer are all included and some halogens may be connected directly to the double bond (column 5, line 60; column 6, line 43; column 7, line 5-26; column 5, line 59-column 6, line 52).

Regarding Claims 11-12, Araki teaches that various mineral fillers can be used, and some are surface treated such as a partly fluorinated carbon (column 12, line 34-67).

Regarding Claim 13, Brinati et al. has disclosed including some acid acceptors such as $\text{Ca}(\text{OH})_2$ and MgO in the composition for vulcanization with accelerators (column 3, line 38-59).

Regarding Claim 14, since a cure site monomer or a diiodine compound is incorporated in the copolymer for crosslinking purpose, the final cured product would carry the claimed or similar mechanical properties due to the presence of reactive sites in the copolymers.

Remaining dependent Claims 2-6, 10 and 16-17 are thereby rejected with the same reason the above rejections of Claims 1, 7-9, 11-15 and 18.

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2. Paglia et al. in view of Araki et al.

Claims 11-13 were rejected under 35 U.S.C. 103(a) as being unpatentable over Paglia et al. (U.S. Patent No. 6,506,460) in view of Araki et al. (U.S. Patent No. 6,706,819 B1).

The Examiner's discussion of the disclosures of the prior art of Paglia et al. for Claims 1-10 and 14-18 of this office action is incorporated here by reference. Regarding Claims 11, 12 and 13, the Examiner indicated that Paglia et al. is silent about including the claimed mineral filler, a surface-treated mineral filler as well as further comprising acid acceptors, which are all taught by Araki et al. in making a curable fluoropolymer composition by including some metal oxides such as SnO₂ and ZnO as well as a partly fluorinated carbon (column 12, line 34-67). According to the Examiner by doing so, the advantage is such a combination in fillers will produce an effective reinforcing the mechanical properties and imparting more electric conductivity (column 12, line 45-column 13, line 59).

The Examiner concluded that one having ordinary skill in the art would have found it obvious to modify Paglia et al. composition by including a surface-treated mineral filler as well as further comprising metal oxides useful as acid acceptors as taught by Araki, with an advantage as such a combination in fillers will produce an effective reinforcing the mechanical properties and imparting more electric conductivity, and thereby producing a persistent, reliable and long-lasting product.

Applicants' Response to the Rejections under 35 U.S.C. § 103

Applicants aver that the amended Claims 1-18 are patentable over Brinati et al. in view of Araki. Claims 11-13 are likewise patentable over Paglia et al. in view of Araki. As noted above, independent claims 1, 15 and 18 have been amended to indicate that the compound includes a peroxide curable component.

Again, present invention is directed to a compound suitable for forming fluoroelastomers having the unique features of a low temperature property and desirable physical properties. The compound includes an elastomeric copolymer having interpolymers derived from vinylidene fluoride (VDF), at least one cure site moiety, and substantially no perfluorinated vinyl ether monomers. The compound also includes a peroxide curable component and at least one mineral filler. Upon vulcanization the resulting compound has desirable physical characteristics

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as indicated by the tensile strength, the elongation, and the temperature to 10% retraction at lower temperature (TR 10).

1. Brinati et al. in view of Araki et al.

Applicants aver that amended Claims 1-18 are patentable over Brinati et al. in view of Araki et al. Brinati et al. disclose terpolymer fluoroelastomers of vinylidene fluoride, hexafluoropropene and tetrafluoroethylene, wherein the polymers have repeating units derived from specific weight percent compositions of each monomer.

Significantly, Brinati et al. provide only for bisphenol-onium cure systems. See page 3, lines 33-45. Brinati et al. do mention that the emulsion polymerization used to prepare the elastomer may include peroxide initiation (page 2, lines 46-49), but they have clearly differentiated this step from the vulcanization (curing) step, in which they require a bisphenol-onium cure system.

In contrast, amended claims 1, 15 and 18 require a peroxide curable component.

As the Examiner admits, Brinati et al. is silent about adding "a cure site moiety" in the course of copolymerization. To overcome this deficiency, the Examiner cited Araki et al. The Examiner averred that Araki teaches that a diiodine compound such as 1,3-diiodoperfluoropropane or if necessary a cure-site monomer can be incorporated in the copolymerization of fluorinated copolymers (citing column 7, line 5-26; column 5, line 59-column 6, line 52; see working example on column 22, lines 35-64).

While Araki does mention adding a cure site moiety, it is readily obvious to one of ordinary skill in the art that the fluoroelastomer described by Araki does not meet the limitations described in amended Claim 1. In particular, Araki describes a polymer blend comprising a multi-segment fluoropolymer and a fluorine-containing resin having a crystalline melting point or glass transition temperature of less than 150°C. See Araki, Claim 1. Such a polymer blend is incapable of meeting the limitation of amended Claims 1 and 15 that the resulting compound has a retraction at lower temperature (TR-10) of -20°C or less.

Therefore, the combination of Brinati et al. with Araki et al. fails to teach, suggest or describe all of the limitations of amended parent Claims 1, 15 and 18 as required by MPEP 2143.03. Furthermore, the Examiner has not established a reasonable expectation of success in incorporating the description of Araki of adding a cure site monomer to the polymer blend

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described therein to the elastomeric polymer described in Brinati (which are exclusively bisphenol-onium curable). See MPEP 2143.02.

Claims 2-14 and 16-17 all depend, either directly or indirectly, from either Claim 1 or Claim 15. Thus, each of these claims is patentable at least on the basis of this dependency from a patentable base claim. Reconsideration of the amended claims and withdrawal of the rejection is respectfully requested.

2. Paglia et al. in view of Araki et al.

As discussed above, Paglia et al. fails to teach, suggest or describe a peroxide curable elastomeric copolymer as described in amended Claim 1. The discussion above with respect to the shortcomings of Paglia et al. is incorporated herein.

Furthermore, as discussed above, Araki et al. fail to teach, suggest or describe a polymer that is capable of meeting the limitation of amended Claims 1 and 15 that the resulting compound has a retraction at lower temperature (TR-10) of -20°C or less. The discussion above with respect to the shortcomings of Araki et al. is incorporated herein.

In combination, Paglia et al. in view of Araki et al. fails to teach, suggest or describe all of the limitations of amended parent Claim 1 as required by MPEP 2143.03. Furthermore, the Examiner has not established a reasonable expectation of success in incorporating the description of Araki of adding a cure site monomer to the polymer blend described therein to the UV curable polymer described in Paglia et al., in order to arrive at workable and successful fluoroelastomer. The failure to show a reasonable expectation of success is further grounds for withdrawal of the present rejection. See MPEP 2143.02.

Claims 11-13 all depend, either directly or indirectly, from amended parent Claim 1. Thus, each of these claims is patentable at least on the basis of this dependency from a patentable base claim. Reconsideration of the amended claims and withdrawal of the rejection is respectfully requested.

The rejection of claims 1-18 under 35 USC § 103(a) as being unpatentable over Brinati et al. in view of Araki et al. has been overcome and should be withdrawn. Likewise, the rejection of claims 11-13 under 35 USC § 103(a) as being unpatentable over Paglia et al. in view of Araki et al. has been overcome and should be withdrawn.

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The Examiner has also recognized Takahashi et al. (U.S. Patent No. 6,191,208) and Guerra et al. (U.S. Patent No. 5,384,374) as being pertinent to the present disclosure. The Applicants recognize that Takahashi et al. and Guerra et al. are pertinent to the present disclosure, but aver that neither defeats the patentability of the presently presented claims.

Conclusion

In view of the foregoing remarks, favorable reconsideration of the present application and the passing of this case to issue with all claims allowed are courteously solicited.

Should the Examiner wish to discuss any aspect of this application, applicants' attorney suggests a telephone interview in order to expedite the prosecution of the application.

Respectfully submitted,

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Date

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